By Nancy Chafin

The makers of our future

IT'S BEEN CALLED the biggest movement in America that you've never heard of. And it's catching on big in Virginia towns and cities from Leesburg to Reston to Charlottesville.

Think of the maker movement as a community of curious tinkerers and entrepreneurial inventors who share tools, space and know-how to build things ranging from fun and games to life-changing products.

Consider the impressive list of well-known products that have been developed by makers: the Square credit card reader, the MakerBot 3D printer, the all-in-one credit card and the Pebble smartwatch.

More than a quirky fringe group, the maker movement has tremendous implications for local economies, our education systems and even the quality of life in the community.

Behind the lovable geekdom is the potential to develop inventions that can change lives, power new industries, and drive a local economy in a new direction. Because it's also about providing a venue for small scale manufacturing.

Makerspaces are doing for manufacturing what the personal computer did to the office world. No longer does an inventor with a great idea have to sell his or her concept to a corporation in order to see it get made. Makers and makerspaces allow inventors to be their own R & D department, to build a physical object and put it into the hands of a consumer – all on a shoestring budget. The maker movement is driving the democratization of manufacturing.

Katie Sheldon Hammler is a firm believer in the potential of the maker movement. As a town council member in Leesburg, she says it will change how business gets done locally.

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– Katie Sheldon Hammler, Leesburg Town Council Member

"In Leesburg, we have suffered from tremendous pressure to re-zone commercial land to residential. It's imperative that we continue to seek creative ways to diversify our local economy and bring high-wage jobs to Leesburg," says Hammler. "When I heard about the maker movement, I realized it could be a major catalyst toward achieving this long term goal."

Hammler was introduced to the movement by Leesburg maker advocate Pat Scannell. Scannell stumbled onto the maker movement as a technology industry executive work-

At Tinkersmiths in Charlottesville, participants attend a workshop on building your own 3D printer.

Creating a zone for maker spaces

AT THE SAME TIME that Leesburg was embracing the maker movement, the town was also working to keep the expansion of the K2M corporate headquarters within Leesburg. K2M produces cutting-edge products used by surgeons to treat complex spinal disorders.

Leesburg was competing against other major cities and other states to land the K2M deal.

But there was a snag. The proposed location of the K2M building was in an area zoned for Class A Office space. K2M would be assembling products in its facilities. To address this new need, the town's planning staff recommended that the zoning regulations be updated to include a wider scope of production activities.

Approving the rezoning for K2M's proposed location to include light industrial uses was a huge victory that made it possible for K2M to expand in Leesburg, bringing with it a $28 million expansion project, adding 100 new high wage jobs and retaining hundreds more.

"Here at K2M, we have always enjoyed strong support from the town and county – and we're proud to be counted as a Leesburg startup success story," said Eric Major, CEO of K2M. "If K2M's success and new facility has helped open the door for Leesburg to attract more inventors and entrepreneurs, then I think that's a very exciting development."

While K2M was making its move, the Makersmiths were looking to open their first dedicated maker space and finding the choices were few and far between. Like K2M, Makersmiths needed a production and R &D zoning class in order to serve as a small scale manufacturing space for inventors and entrepreneurs.

Shortly after the K2M rezoning, the Leesburg council amended the zoning ordinance to add research, development and production as by-right activities in most commercial areas including historic downtown.

This paved the way for Makersmiths to open its first maker space on August 1. The 3,000 square foot facility is located in near downtown Leesburg.

The grand opening of Makersmiths' first official maker space on August 1. (L to R) Leesburg Council Member Katie Sheldon Hammler, Leesburg Vice Mayor Kelly Burk, Leesburg Mayor Kristen Umstattd, Purcellville Mayor Kwasi Fraser, Makersmiths founder Pat Scannell, Congresswoman Barbara Comstock, Loudoun Chamber of Commerce President Tony Howard and Makersmiths member Sean Connaghan.

ing with big tech industry corporate partners like Google and Amazon. "In the U.S., we have plenty of software talent, but often the constraint is on the hardware side," says Scannell. "For every good idea, it's difficult to find someone who will make the physical product."

Scannell is now the executive director of a not-for-profit start-up maker group called Makersmiths. When he met Hammler, he was looking for a location for a maker space. Hammler immediately convinced him to find a location in Leesburg, the county seat of Loudoun.

"The timing of Makersmiths choosing a location was a catalyst for Leesburg to prepare our zoning for the 21st century," says Hammler. "In the short term, the maker space will offer important work-force skills for citizens while inspiring their entrepreneurial spirit. In the longer term, an increased base of skilled residents will allow the town to attract established manufacturing firms."

Along with the active support Hammler provided as an elected official, Scannell chose Leesburg as the location for Makersmiths for several reasons. "The area is well known for its highly-educated, highly paid knowledge-workers. Looking beyond those numbers, you find one of the lowest percentage of manufacturing jobs in the country and also one of the country's highest average commute times to service-based jobs," says Scannell.

Ironically, however, Leesburg is home to workforce icons like SkillsUSA, the national institute for vocational education and Automotive Services Exellence (ASE), the nation's leading automotive certification organization (ASE).

"I realized that when you put those two things together," said Scannell, "we would have an amazing opportunity to re-introduce skilled knowledge workers to the manufacturing processes."

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As a result of lobbying by town officials, and the changes to zoning ordinances (see "creating a zone" on page 11), Makersmiths decided on an initial space in Leesburg of 3,000 square feet, where they can comfortably accommodate up to the first 50 members. Their grand opening was August 1.

The maker's recipe for stone soup

Scannell says there are about 300 community maker spaces in the U.S. If you include those set up in schools, the number may be as high as 800. The most common type is the non-profit, all volunteer model. Leesburg's Makersmiths is one of them. They are funded by member dues and rely on the stone soup model in which everyone contributes tools and skills.

NOVALabs in Reston is supported by member dues and corporate sponsorships. Among many great inventions coming out of NOVAlabs are prosthetic hands for disabled children. At the request of several local families, NOVALabs members have designed and built hands that are custom-fitted for their children. Steve Bloom used a 3-D printer to make a hand for a 6-year-old boy. Bloom says, "When you get to use your skills to do something so special for a person, it's like Christmas times a thousand."

There are also for-profit maker spaces which often have corporate partners and/or corporate clients. Tinkersmiths in Charlottesville has an impressive list of clients, but it also provides free workshops and services to the community.

"We regularly help inventors move from idea to product – to take something they dreamed about, offer advice and guidance and give them a plan to get to the physical manifestation. The next stage is first- round manufacturing," says Gopal Metro, a career counselor at Tinkersmiths.

Having a local maker space like Tinkersmiths can be a draw for new businesses, including high tech companies. It signals to them that the local community has the culture and the people they want to work with.

Why kids must fail

Scannell says the maker movement has four key audiences: entrepreneurs; students, community organizations and adult enthusiasts (aka hobbyists). The entrepreneurial types get the most press for their economic impact, but the maker movement also offers major benefits in education and the overall quality of life in a community.

Scannell says the maker movement fills an important gap in our current education system, offering hands-on experience that supplements the classroom curriculums.

"The focus on standardized testing takes a lot of oxygen out of the room. The U.S. curriculum is dominated by success and rankings. Kids don't get much chance to fail."

Scannell says that's a problem because "failure is the root of all innovation and, oftentimes, business success. Failure could well be the motto of U.S. innovation." Inventors and entrepreneurs throughout history tried lots of things that failed on their path to finding break-through products and technical advancements.

"The maker movement is the best way to teach STEAM, but more importantly," says Scannell, "I think it represents a powerful augment to today's school system, filling in key gaps that are important to kids in all fields."

In maker spaces around Virginia and the country, students from elementary through high school are tinkering with circuit boards, robots, 3D printers and other tools. They try different things, figure it out and then show other kids how they did it.

"Education that has been a key focus for us with hands-on workshops," says Metro. "If we don't have people building something within the first half hour, then we're doing something wrong."

By partnering with local schools, makers paces provide a venue for students to have hands-on experience with the STEAM curriculums they are learning in the classroom.

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Why grown ups must play

Outsiders often dismiss adult hobbyists in the maker space as idle tinkerers. On the contrary, Scannell says, the maker movement offers adults something that transcends commerce, manufacturing, economies and education.

"What's the point of making businesses, jobs, STEM students, and entrepreneurs if people end up being unsatisfied adults?"

Scannell says having a local maker space and community has a direct effect on the quality of life within that community.

"Modern life can be stressful. Research on happiness points toward being a part of something bigger than yourself, connecting with others and a sense of personal progress toward something meaningful," says Scannell. Making provides adults with "a chance to connect with others, meaningfully, to learn new skills and become happy and fulfilled."

Gopal says that makers provide "a public space in which to have a very new and different kind of fun. That's quality of life."

Makers at Tinkersmiths create motion sensors with blinking lights using the Arduino microcontroller.

Collaborating with community organizations

Maker spaces are at their best when they are collaborating with other community organizations – from YMCAs to art guilds to libraries. In fact, maker spaces may well be the means to re-invent the public library. As public spaces for learning, libraries are a natural fit for maker spaces. Librarians seem uniquely drawn to the maker movement, eager to open spaces and teach. From Cleveland to Tuscon, there are several models across the country of vibrant maker spaces in libraries.

In Leesburg, Makersmiths is planning to partner with a local organization that works with homeless teens. Makersmiths hopes to help these kids learn valuable skills and have fun in the process.

How to get makers moving in your town

Many local governments understand the economic and educational potential of makerspaces but aren't sure how to foster the maker movement in their community.

First, be aware that there are probably already makers in your community who just haven't found each other. Many of them don't even realize they are makers. They are welders who want to teach, kids tinkering with 3D printers their parents bought for them, hobbyists with desktop CNC machines in their basements, and retirees with woodshops in their garages.

Maker spaces in Virginia

Makersmiths in Leesburg

NOVAlabs in Reston

Tinkersmiths in Charlottesville

757 Makerspace in Norfolk

Contact or visit one near you to find out how to ignite the Maker movement in your community.

The next step is drawing them out. There's a ready-made tool that towns and cities can use. It's a powerful documentary called "Maker, The Movie" (makerthemovie.com) that explains what the maker movement is and how anyone can join in. Leesburg hosted and promoted a viewing of the film that Scannell says communicates the excitement and power of the makers to a broader constituency.

Scannell encourages local officials to do a little research on the maker movement. The online and printed resources are extensive, including TechShop (www.techshop.ws), Maker Faire (www.makerfaire.com) and Make: magazine (www.makezine.com).

Localities can also contact the nearest maker space in their region, pay a visit, and see the energy in a makerspace firsthand. In Virginia, there are several makerspaces, including NOVAlabs in Reston, Tinkersmiths in Charlottesville, 757 Makerspace in Norfolk, Makersmiths in Leesburg and a few others.

Makerspaces can also happen in small towns. The League, the Town of Leesburg and the Makersmiths want to help translate the maker movement to smaller communities. For more information, contact Nancy Chafin at nchafin@vml.org.

Pat Scannell, founder of Makersmiths, and Katie Sheldon Hammler, Leesburg Council Member, visit a prototyping facility that manufactures products that might typically be developed in maker spaces.

Using a 3D printer, Steven Bloom of NOVALabs in Reston designed a prosthetic hand for a six-year-old boy. The boy requested for it to look like Iron Man, so Bloom used the red and yellow colors.